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Poster/Abstracts

Title:
Motion Compensation and Cardiac Nuclear Medicine Imaging

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Abstract:
Improved resolution in positron emission tomography (PET) requires technological innovation to compensate for motion, particularly in imaging the human heart. The promise of quantitative measurement and visualization of myocardial perfusion and metabolism with PET depends on a solution to this problem. Over the past 25 years, the spatial resolution attainable by PET systems has improved dramatically, from 17 mm in 1974 to approximately 4 to 5 mm for today's commercial cardiac scanners. Future developments are expected to lead to scanners with resolution better than 3 mm. With this improved resolution, there is the potential to obtain detailed maps of cardiac function. However, this potential remains largely unfulfilled because current data acquisition and analysis strategies do not account for the respiratory and contractile motion of the heart. Movement of the heart and diaphragm during tidal breathing can reach 15 to 20 mm, and motion of cardiac contraction typically ranges from 5 to 15 mm. This motion blurs the reconstructed images, and while they are still reasonable qualitative estimates of myocardial activity, they fall far short of the high-resolution quantitative images that are potentially attainable. Techniques are being developed to accurately detect and compensate for heart motion to make possible high-resolution, low-noise images for greater clinical utility. Principal methods entail the addition of spatially registered images from multiple respiratory phases to account for respiratory motion of the heart. Similarly, deformable motion models are being used to account for contractile cardiac motion, and data from different cardiac phases are also combined to improve resolution without loss of statistics.

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